

REMARKS

Claims 1-45 have been cancelled. New Claims 46-53 have been added. Hence, Claims 46-53 are active and under consideration.

REQUEST FOR RECONSIDERATION

Claims 26-30 are rejected under 35 U.S.C. §102(b) as being anticipated by Trieselt et al. (U.S. '215).

However, this reference is said to disclose a detergent composition, containing a water soluble copolymer. The copolymer contains 95.5 to 15 mol% of one or more monoethylenically unsaturated C₃ – C₆ monocarboxylic acids (i.e. (meth) acrylic acid), 0.5 to 20 mol % of one or more co-monomers containing two or more ethylenically unsaturation sites (i.e. ethylene glycol di (meth) acrylates; col. 9-10, Table 1), up to 20 mol% of one or more hydroxyalkyl esters, and up to 30 mol% of other water soluble monoethylenically unsaturated comonomers (col. 7, lines 15-21; working examples).

This reference also describes a method to prepare the water soluble copolymers. It may be noted that the patent claims polymers containing 0.5 to 20 mol % of one or more than one comonomers containing two or more ethylenically unsaturated sites. The examples cited in table I limit the content of such comonomers from 1.8 to 5.3 mole%. Further, the comonomers are restricted essentially to dimethacrylate or diacrylate although the claims refer to comonomers containing two or more unsaturated sites which have two or more than two ethylenically unsaturated sites. The purpose of

incorporating the comonomers containing two or more ethylenically unsaturated sites is mentioned by the inventor in col. 3 lines 6 to 15, which are quoted verbatim below.

“As essential constituent of the copolymer comprises the monomer of components (b). They are comonomers, which have two or more ethylenically unsaturated, nonconjugated double bonds and are linked by one or more ester groups. These comonomers in general bring about an increase in the molecular weight of the copolymer and are involved in the buildup of the copolymer in a proportion of from 0.5 to 20, preferably from 1 to 12, mol%.”

To one skilled in the art it would be readily apparent that this increase in the molecular weight of copolymer takes place because both unsaturated sites of the monomer containing more than one ethylenically unsaturated double bonds take part in polymerization. This reaction can be either branching or crosslinking. Indeed the same approach was used by Matz et al. in U.S. Patent 6,691,715 (also cited by the examiner and later rebutted). It is therefore quite clear that in the case of polymers discussed by Trieselt et al. an increase in molecular weight results as all unsaturated sites are consumed in the polymerization reaction.

In contrast, the presently claimed copolymer composition contains monomers bearing multiple vinyl groups of which only one vinyl group takes part in the polymerization. This selective polymerization is a result of the formation of an inclusion complex wherein the unsaturated site is included in the cyclodextrin cavity and hence does not take part in polymerization. Thus, the presently claimed copolymer is soluble in organic solvent and contains pendant unreacted vinyl unsaturations in polymer structure thereof. The polymers disclosed in Trieselt et al. are prepared for use in

detergent compositions, which are aqueous. In contrast, the presently claimed polymers are insoluble in water as all the multivinyl monomers used are hydrophobic in nature and are not intended for use in aqueous media. The present specification describes selective polymerization of multivinyl monomers, carried out by protecting the vinyl groups from polymerization by formation of its inclusion complex with cyclodextrin or its derivative in stoichiometric proportion e.g. for a divinyl monomer such as ethylene glycol dimethacrylate the molar ratio of divinyl monomer to macromolecular organic compound, i.e., cyclodextrin is 1:1 while in case of trivinyl monomer such as trimethylolpropane trimethacrylate the ratio is 1:2. Thus, in case of ethylene glycol dimethacrylate: cyclodextrin complex, one of the vinyl groups included in the cavity of cyclodextrin and other vinyl group lies outside, while in case of trimethylolpropane trimethacrylate: cyclodextrin complex two vinyl groups are included in the cavity of cyclodextrin and only one vinyl group is free to react. Thus, in both the cases the divinyl or trivinyl monomers, only one of the vinyl group is free to react with other comonomer. Thus, the inclusion complex when subjected to copolymerization with other monovinyl comonomers undergoes selective polymerization with the vinyl group, which is outside the cavity of cyclodextrin and the polymerization proceeds without crosslinking. But, in Trieselt et al. all the unsaturated groups are free to react during the polymerization so that the molecular weight of resulting polymer increases. It has also been demonstrated in present comparative example (example no. 3) in the present specification that the use of multivinyl monomers without formation of inclusion complex with cyclodextrin leads to crosslinked products, which are not soluble in any solvent including water.

Thus, the main objective of the copolymerization reaction disclosed in the present specification is to prepare an organic solvent soluble copolymer wherein only one unsaturated site of the monomer containing multiple vinyl unsaturated sites is reacted during polymerization and other sites are protected by formation of an inclusion complex with cyclodextrin. The resulting polymer, thus, contains pendent unsaturated groups in the polymer structure thereof.

The purpose of incorporating monomers containing more than one unsaturated site in accordance with the present invention is entirely different than in Trieselt et al. Our comparative example (example No. 3) clearly demonstrates that if the unsaturated sites in multivinyl monomers are not protected by an inclusion complexation as practiced by Trieselt et al. insoluble, crosslinked products result. It is, thus, clear that the claimed polymer composition, as well as, the method of preparing the polymer composition of claims 46-53 are not anticipated by Trieselt et al.

Hence, this ground of rejection is unsustainable and should be withdrawn.

Claims 31-40, and 45 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Trieselt et al. (U.S. '215) for the reason set forth in the preceding paragraph and further in view of the following remarks.

As discussed, prior art teaches the optional inclusion of monoethylenically unsaturated comonomers (d) and (e) within the scope of the instant (Ax) vinyl monomer comprising single unsaturation. Suitable comonomers disclosed include, vinyl acetate, acrylonitrile, (meth) acrylamide, which encompass and at least closely analogous to the copolymer species expressed in the present dependant claims. The crosslinkable property expressed in the claim 45 is expected in light of the

presence of unsaturation in the resultant water soluble copolymer. Accordingly, it would have been obvious and readily envisaged by one skilled in the art to form water soluble copolymer containing the respective proportions of monounsaturated and polyunsaturated monomers as taught, motivated by the reasonable expectation of success.

As noted above, in accordance with the present invention, multivinyl monomers are used as inclusion complexes with cyclodextrin. The polymerization of the inclusion complex proceeds without crosslinking to yield organic solvent soluble polymer (polymers are insoluble in water because they are hydrophobic) whereas, in Trieselt et al. the multivinyl monomers are used to increase the molecular weight of the polymer which is possible only when more than one unsaturated site of the multivinyl monomer participate during polymerization.

Thus, polymers of the composition described by Trieselt et al. are clearly distinct from the ones presently claimed and cannot, moreover, be obtained by the polymerization method described in our application.

Conversely, the presently claimed polymer compositions are distinctly different from those described in Trieselt et al. and can not be obtained by the method described in Trieselt et al.

Hence, this ground of rejection is unsustainable and should be withdrawn.

Claims 26-40 and 45 are rejected under 35 U.S.C. §103(a) as being unpatentable over Matz et al.

However, Matz et al. merely discloses a process for making water soluble polymers, containing at a maximum up to 1 mole % of crosslinking monomer (col. 7 lines 13 to 20). Col. 5 lines 42 to 67 describe the choice of various monomers and crosslinkers used for preparing water soluble polymer compositions claimed in U.S. patent 6,691,715.

A particular embodiment of this patent is a branched or crosslinked polymer prepared from monomers described in col. 5 lines 42 to 67. According to another embodiment the composition of crosslinking monomer is from 0.0001 to about 0.1 mole % (col. 7, lines 54 to 56 and col. 9, lines 49 to 51, col. 17, lines 32 to 38, lines 46 to 49 and col. 18, lines 12 to 18 and line 40 to 42).

More importantly, this reference also describes how the branched polymers are obtained (col. 10 lines 13 to 25), which is cited below verbatim:

“As used herein, the term “branched” refers to an addition polymer, made using a free radical initiator source, which has included in the mixture of monomers employed, some content of monomer that contains multiple polymerizable double bonds. Typically, these monomers will contain between two and six polymerizable double bonds. The resulting “branched” polymers can remain completely water soluble, water dispersible or in the extreme case be only water swellable. The later is an example of crosslinking resulting from the situation in which the level of multi double bond containing monomer results in crosslinked and or network structure which is well known to those skilled in the art of polymer synthesis.”

From the above statement, it is abundantly clear that the branched polymers are obtained as a result of addition of a vinyl monomer containing single unsaturation to monomer, which has multiple unsaturated sites. Also, similar addition between two

monomers having multiple unsaturation sites will result in crosslinking. It is therefore clear that during the course of polymer synthesis, all unsaturated sites of the monomer, which has multiple unsaturation sites, are reacted leading to either branching or crosslinking. Thus, more than one unsaturated site of multivinyl monomers is consumed during the polymerization step as to lead to copolymers, which are either branched or crosslinked.

In contrast, the primary objective of the present invention is to synthesize organic solvent soluble copolymers in which only one of the unsaturated sites of a monomer having multiple vinyl groups is reacted during polymerization by protecting other sites during the polymerization step so as to avoid crosslinking and/or branching reactions. The resulting copolymers, therefore, are soluble in solvents, especially in these case organic solvents and contain unsaturated vinyl groups in polymer structure. It may also be noted, that the extent of incorporation of multivinyl monomer in the polymer achievable by the approach proposed by us, is far higher than that possible using the method proposed by Matz et al. U.S. patent 6,691,715 B2.

Hence, this ground of rejection is unsustainable and should be withdrawn.

Claims 26-41, and 45 are selected under 35 U. S. C. §103 (a) as being unpatentable over Huang (US -901).

The patent application U.S. 2002/0110901 A1 refers to "Compositions and methods for surface imprinting. It discloses a method of preparing surface imprint composition, which comprises a matrix material. The matrix material used in [0059] is typically a compound that undergoes a chemical or light induced liquid to solid-state

change such as polymerizable compounds listed in [0065]. It may be noted that the matrix material prior to polymerization is a mixture of monomers, which contain a) vinyl monomer comprising single unsaturation and also b) vinyl monomer comprising multiple unsaturations. Since these are monomer mixtures, these are soluble. The polymerization of this matrix can be induced by any means, including thermal, chemical and / or electrochemical processes as described in [0062] to give final crosslinked product.

During polymerization the matrix containing monomer mixtures, which is soluble is converted into copolymer, which is a crosslinked dense solid product. But this product is not soluble. It is thus clear that at no stage does this reference disclose or suggest a copolymer which has unreacted vinyl groups and is also soluble in a solvent.

In contrast, the present invention entails the copolymerization of A and B monomers wherein, A is any vinyl monomer with single unsaturation and B is vinyl monomer with two or more unsaturations; where all but one unsaturated site of monomer B is in cavity of cyclodextrin, and these do not participate in polymerization, thereby leading to soluble polymers containing unreacted vinyl unsaturations. Here, the crosslinking is prevented by carrying out polymerization of crosslinker in the form of an inclusion complex with β -cyclodextrin. The copolymerization of a mixture of monomers containing a) single unsaturation and b) multiple unsaturations leading to soluble copolymers by protecting one or more vinyl unsaturations as a result of inclusion complex formation with β -cyclodextrin thereby preventing the participation of vinyl group in polymerization reaction is not known in prior art. Nor is the approach of the present

invention anticipated from U.S. patent application U.S. 2002/0110901 A1 to Huang.

Hence, this ground of rejection is unsustainable and should be withdrawn.

Thus, in summary the subject matter of present claims 46-53 differs from the cited references as follows:

1. U.S. patent 4,897,215 to Trieselt et al. discloses the use of comonomers containing two or more ethylenically unsaturated sites to increase the molecular weight of resulting water soluble polymer. This cannot be achieved unless more than one double bond of a monomer containing multiple vinyl groups participates in polymerization.

2. U.S. patent 6,691,715 to Matz et al. discloses the use of multiple unsaturated monomers for branching or crosslinking. This too cannot happen unless more than one unsaturated sites of the multivinyl monomer participates in polymerization.

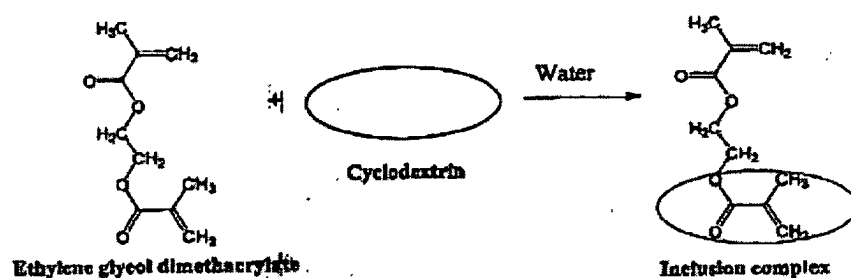
3. U.S. patent application 2002/0110901 A1 to Huang discloses the use of multiple unsaturated monomers as one of the polymerizable component in matrix material for surface imprint composition. The matrix material is polymerizable as it is a mixture of monomers and not a polymerized product. The polymerization of the matrix composition gives the crosslinked material indicating the reaction of multiple unsaturated monomers with more than one vinyl unsaturation.

In contrast, the presently claimed polymer composition is obtained by the selective polymerization of monomers containing more than one vinyl unsaturation and a process for selective polymerization by inclusion complexation with cyclodextrin to yield organic solvent soluble polymers with unreacted pendant vinyl unsaturations in

polymer structure. The polymers obtained are insoluble in water because they are hydrophobic and soluble in solvents as they are not crosslinked.

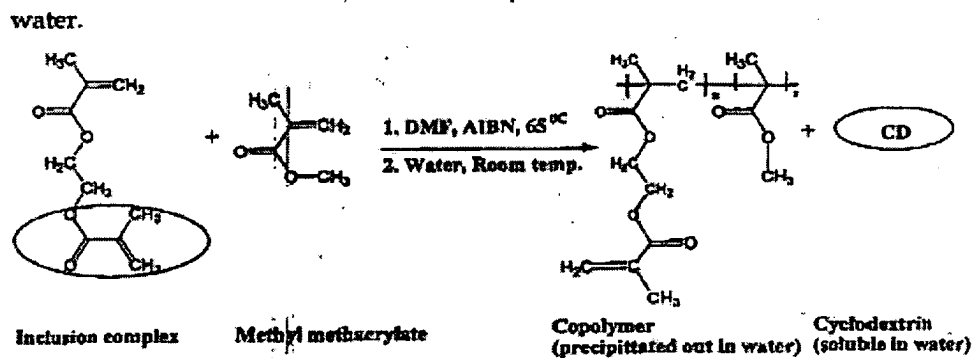
Schematic representation of our invention exemplified with copolymerization of Ethylene glycol dimethacrylate-f3-CD inclusion complex with methyl methacrylate.

1. Inclusion complex formation of multivinyl monomer (Ethylene glycol dimethacrylate) with Cyclodextrin in water



2. Copolymerization of multivinyl monomer with monovinyl monomer (methyl methacrylate): - Polymerization was carried out in N, N dimethyl formamide.

(DMF) using 2,2' Azobisisobutyronitrile (AIBN) as an initiator at 65°C. The polymer was precipitated in water. The copolymer comprising monovinyl monomer and multivinyl monomer which has reacted with only one of its vinyl unsaturation was obtained as precipitate while cyclodextrin remains soluble in water.



All of the above amendments are fully supported by the disclosure and claims as originally filed. No new matter has been added. Further, in view of the clearly patentable status of claims 46-53 entry of this Amendment is deemed to be appropriate.

Accordingly, in view of the above, it is believed that the present application is now in condition for allowance. Early notice to this effect is earnestly solicited.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 07-1337 and please credit any excess fees to such deposit account.

Respectfully submitted,

LOWE HAUPTMAN & BERNER LLP

William E. Beaumont
Registration No. 30,996

Customer Number: 22429
1700 Diagonal Road, Suite 300
Alexandria, Virginia 22314
(703) 684-1111 WEB/sj
(703) 518-5499 Facsimile
Date: **January 19, 2006**